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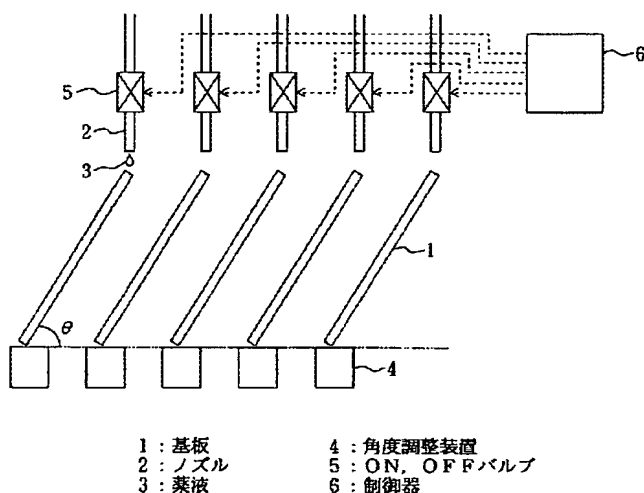
Epitome

(57) [Abstract]

[Technical problem] The substrate washing approach that the field of a substrate can be removed without moreover a foreign matter carrying out the reattachment to homogeneity, and its equipment are offered.

[Means for Solution] The substrate 1 which it is going to wash is set up at the include angle theta with the highest elimination factor of a foreign matter to a drug solution. This include angle theta is made to adjustable with the include-angle adjusting device 4. Thus, a foreign matter is certainly removable with surface tension by a drug solution's 3 becoming wave-like and falling on the front face of a substrate 1, by turning on and turning off ON and the off-bulb 5 which are installed in piping by which a drug solution 3 is connected to the set-up substrate 1 from a nozzle 2 at a nozzle 2 with the control signal from a controller 6.

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CLAIMS

[Claim(s)]

[Claim 1] (a) The substrate washing approach characterized by giving the process which a substrate is made to incline and is set up, and the process which carries out the regurgitation of the drug solution to said substrate side intermittently from the (b) nozzle.

[Claim 2] The substrate washing approach characterized by making the include angle of said substrate correspond to the class of drug solution, and changing it in the substrate washing approach according to

claim 1.

[Claim 3] The substrate washing approach characterized by setting to the substrate washing approach according to claim 1, and turning on and turning off supply of the drug solution from said nozzle continuously.

[Claim 4] (a) The substrate washing approach characterized by giving the process which a substrate is made to incline and is set up, and the process to which said substrate is made to slide while carrying out the regurgitation of the drug solution to said substrate side from the (b) nozzle.

[Claim 5] (a) The substrate washing approach characterized by giving the process which a substrate is made to incline and is set up, and the process to which said nozzle is made to slide while carrying out the regurgitation of the drug solution to said substrate side from the (b) nozzle.

[Claim 6] (a) a substrate setting means to make a substrate incline and to set up, and (b) -- the nozzle which supplies a drug solution to said substrate side, and (c) -- the substrate washing station possessing the drug solution regurgitation means which carries out the regurgitation of the drug solution from said nozzle to said substrate side intermittently.

[Claim 7] It is the substrate washing station with which said substrate setting means possesses the modification means of the include angle of said substrate in a substrate washing station according to claim 6.

[Claim 8] It is the substrate washing station which sets to a substrate washing station according to claim 6, and possesses the control means which said drug solution regurgitation means turns on supply of the drug solution from said nozzle continuously, and turns off.

[Claim 9] (a) a substrate setting means to make a substrate incline and to set up, and (b) -- the nozzle which supplies a drug solution to said substrate side, and (c) -- the substrate washing station possessing the means to which said substrate setting means is made to slide.

[Claim 10] (a) a substrate setting means to make a substrate incline and to set up, and (b) -- the nozzle which supplies a drug solution to said substrate side, and (c) -- the substrate washing station possessing the means to which said nozzle is made to slide.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the washing approach of a substrate (a mask and semi-conductor wafer), and its equipment.

[0002]

[Description of the Prior Art] Generally, the washing station of the conventional substrate was constituted as follows.

(1) It rotates one substrate at a time, and cover a drug solution. (2) Raise by standing a substrate perpendicularly and dipping in a drug solution (DIP).

[0003]

[Problem(s) to be Solved by the Invention] However, in the washing station of the above-mentioned conventional substrate, the elimination factor of a foreign matter is different with the rotary system of the above (1) on the core and outside of a substrate. Moreover, by the method which the above (2) dips, there was a trouble that a foreign matter carried out the reattachment.

[0004] This invention aims at offering the substrate washing approach which removes the above-mentioned trouble, and can be removed, without moreover a foreign matter carrying out the reattachment of the field of a substrate to homogeneity, and its equipment.

[0005]

[Means for Solving the Problem] This invention is made to give the process which a substrate is made to incline and is set up, and the process which carries out the regurgitation of the drug solution to said substrate side intermittently from a nozzle in the (1) substrate washing approach, in order to attain the above-mentioned purpose.

(2) In the substrate washing approach of the above-mentioned (1) publication, make the include angle of said substrate correspond to the class of drug solution, and change it.

[0006] (3) Set to the substrate washing approach of the above-mentioned (1) publication, continuously, turn on supply of the drug solution from said nozzle, and turn it off.

(4) Be made to give the process which a substrate is made to incline and is set up, and the process to which said substrate is made to slide while carrying out the regurgitation of the drug solution to said substrate side from a nozzle in the substrate washing approach.

[0007] (5) Be made to give the process which a substrate is made to incline and is set up, and the process to which said nozzle is made to slide while carrying out the regurgitation of the drug solution to said substrate side from a nozzle in the substrate washing approach.

(6) Provide a substrate setting means to make a substrate incline and to set up, the nozzle which supplies a drug solution to said substrate side, and the drug solution regurgitation means which carries out the regurgitation of the drug solution from said nozzle to said substrate side intermittently in a substrate washing station.

[0008] (7) In the substrate washing station of the above-mentioned (6) publication, said substrate setting means possesses the modification means of the include angle of said substrate.

(8) Setting to the substrate washing station of the above-mentioned (6) publication, said drug solution regurgitation means possesses the control means which turns on and turns off supply of the drug solution from said nozzle continuously.

[0009] (9) Provide a substrate setting means to make a substrate incline and to set up, the nozzle which supplies a drug solution to said substrate side, and the means to which said substrate setting means is made to slide in a substrate washing station.

(10) Provide a substrate setting means to make a substrate incline and to set up, the nozzle which supplies a drug solution to said substrate side, and the means to which said nozzle is made to slide in a substrate washing station.

[0010] Thus, since it constituted, by carrying out the regurgitation of the drug solution from the (A) nozzle to the sloping substrate side intermittently, a drug solution can be dropped in the shape of a wave on a substrate front face, and a foreign matter can be certainly removed with surface tension.

(B) By adjusting the include angle of a substrate according to the class of drug solution, the optimal foreign matter is removable.

[0011] (C) The removal effectiveness of a foreign matter can be raised with an easy configuration by turning on and turning off supply of the drug solution from a nozzle continuously.

(D) By making a substrate slide, the configuration by the side of a nozzle can be facilitated, and a foreign matter can be removed.

(E) By making a nozzle slide, the configuration by the side of a substrate can be facilitated, and a foreign matter can be removed.

[0012]

[Embodiment of the Invention] Hereafter, it explains to a detail, referring to a drawing about the gestalt of operation of this invention. Drawing 1 is the outline block diagram of the substrate washing station in which the 1st example of this invention is shown, and shows the side face of a substrate. Drawing 2 is the front view of the substrate washing station. It is a drug solution 3 (for example, it is set as the include angle theta with the highest elimination factor of a foreign matter (for example, 15 - 60 degrees) to a sulfuric acid, hydrogen peroxide solution, etc.) about the substrate 1 which it is going to wash as shown in these drawings. This include angle theta can be made adjustable with the include-angle adjusting device 4. Moreover, the include-angle adjusting device 4 can adjust this include angle theta according to the class (when a drug solution is a sulfuric acid and 45 - 60 degrees and a drug solution are hydrogen peroxide solution, it is 15 - 45 degrees) of drug solution.

[0013] Thus, by turning on and turning off ON and the off-bulb 5 which are installed in piping for which a drug solution 3 is connected to a nozzle 2 with the control signal from a controller 6 from a nozzle 2 in the

set-up substrate 1 (for example, 2 – 3-second ON, 5-second OFF), on the front face of a substrate 1, a drug solution 3 can become wave-like, it can fall (refer to drawing 3), and a foreign matter can be certainly removed with surface tension.

[0014] The partial side elevation of the substrate washing station which drawing 3 shows the 1st example of this invention, and drawing 4 are the partial front views of the substrate washing station, and show the appearance of the drug solution on the front face of a substrate. As shown in these drawings, a substrate 1 is set to the include angle theta with the high elimination factor of a foreign matter with the include-angle adjusting device 4 (for example, the set include angle of a substrate 1 is adjusted by meeting and moving the substrate receptacle 8 to the radii-like guide slot 9).

[0015] Next, the regurgitation of a drug solution is turned on and turned off and is made for wave-like drug solution 3' to start the front face of a substrate 1 by actuation of ON and the off-bulb 5 (refer to drawing 1). In addition, 7 is the guide of the drug solution 3 arranged in the upper part of a substrate 1. Thus, according to the 1st example, a foreign matter is certainly removable with the surface tension at the tip of a wave by making a substrate breathe out a drug solution in the shape of a wave. Effectiveness is acquired more by repeating this.

[0016] Next, the 2nd example of this invention is explained. Drawing 5 is the outline block diagram of the substrate washing station in which the 2nd example of this invention is shown, and shows the side face of a substrate. In this example, the same effectiveness as ON of the drug solution shown in the 1st example of the above and OFF can be acquired by forming the fixture 12 which set the substrate 11 and in which horizontal migration is possible, carrying out both-way migration of this fixture 12 horizontally with a driving gear 13, and carrying out the regurgitation of the drug solution 15 from the nozzle 14 of the fixed piece.

[0017] That is, a drug solution 15 is made to breathe out, both-way actuation is carried out and a fixture 12 is made to set a substrate 11 to a fixture 12 and to slide with a driving gear 13 from a nozzle 14. Next, the 3rd example of this invention is explained. Drawing 6 is the outline block diagram of the substrate washing station in which the 3rd example of this invention is shown, and shows the side face of a substrate.

[0018] In this example, the same effectiveness as ON of the drug solution shown in the 1st example of the above and OFF can be acquired by carrying out the regurgitation of the drug solution 24 from the nozzle 23 of a piece which fixes the fixture 22 which set the substrate 21 and carries out both-way migration of the nozzle 23 horizontally with a driving gear 25. That is, while setting a substrate 21 to a fixture 22, fixing and making a drug solution 24 breathe out from a nozzle 23, both-way migration is carried out and a nozzle 23 is made to slide with a driving gear 25.

[0019] In the 2nd and 3rd above-mentioned example, a piece or many is also available for a nozzle. Moreover, piece arrangement of the nozzle is carried out, ON of a drug solution and OFF are performed for every substrate, a substrate is finished for every sheet, and you may make it end washing by migration of an one direction. Moreover, although the above-mentioned example explained the example applied to the washing station, it is applicable also to a developing machine and an etching system.

[0020] In addition, this invention is not limited to the above-mentioned example, and based on the meaning of this invention, various deformation is possible for it and it does not eliminate these from the range of this invention.

[0021]

[Effect of the Invention] As mentioned above, according to this invention, the following effectiveness can be done so as explained to the detail.

(1) According to invention according to claim 1 or 6, by carrying out the regurgitation of the drug solution from a nozzle to the sloping substrate side intermittently, a drug solution can be dropped in the shape of a wave on a substrate front face, and a foreign matter can be certainly removed with surface tension.

[0022] (2) According to invention according to claim 2 or 7, the optimal foreign matter is removable by adjusting the include angle of a substrate according to the class of drug solution.

(3) According to invention according to claim 3 or 8, the removal effectiveness of a foreign matter can be raised with an easy configuration by turning on and turning off supply of the drug solution from a nozzle continuously.

[0023] (4) According to invention according to claim 4 or 9, by making a substrate slide, the configuration by the side of a nozzle can be facilitated, and a foreign matter can be removed.

(5) According to invention according to claim 5 or 10, by making a nozzle slide, the configuration by the side of a substrate can be facilitated, and a foreign matter can be removed.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the substrate washing station in which the 1st example of this invention is shown.

[Drawing 2] It is the front view of the substrate washing station in which the 1st example of this invention is shown.

[Drawing 3] It is the partial side elevation of the substrate washing station in which the 1st example of this invention is shown.

[Drawing 4] It is the partial front view of the substrate washing station in which the 1st example of this invention is shown.

[Drawing 5] It is the outline block diagram of the substrate washing station in which the 2nd example of this invention is shown.

[Drawing 6] It is the outline block diagram of the substrate washing station in which the 3rd example of this invention is shown.

[Description of Notations]

1, 11, 21 Substrate

2, 14, 23 Nozzle

15 3, 3', 24 Drug solution

4 Include-Angle Adjusting Device

5 ON, Off-Bulb

6 Controller

7 Guide

8 Substrate Receptacle

9 Guide Slot

12 22 Fixture

13 25 Driving gear

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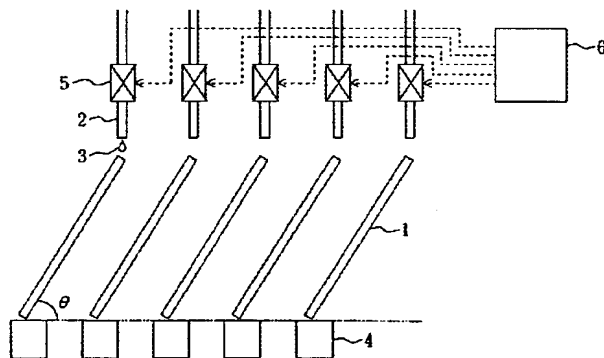
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(54)【発明の名称】 基板洗浄方法及びその装置

(57)【要約】

【課題】 基板の面を均一に、しかも異物が再付着することなく除去することができる基板洗浄方法及びその装置を提供する。

【解決手段】 洗浄しようとする基板1を薬液に対して最も異物の除去率の高い角度 θ で設定する。この角度 θ は角度調整装置4により可変にできる。このように設定された基板1にノズル2より薬液3をノズル2に接続される配管に設置されるON、OFFバルブ5を制御器6からの制御信号によりON、OFFすることにより、基板1の表面上に薬液3が波状になり落下することにより、表面張力で異物を確実に除去することができる。



1 : 基板
2 : ノズル
3 : 薬液
4 : 角度調整装置
5 : ON, OFFバルブ
6 : 制御器

【特許請求の範囲】

【請求項1】(a)基板を傾斜させて設定する工程と、
(b)ノズルから薬液を前記基板面に間欠的に吐出する
工程とを施すことを特徴とする基板洗浄方法。

【請求項2】請求項1記載の基板洗浄方法において、
前記基板の角度を薬液の種類に対応させて変更すること
を特徴とする基板洗浄方法。

【請求項3】請求項1記載の基板洗浄方法において、
前記ノズルからの薬液の供給を連続的にON、OFFす
ることを特徴とする基板洗浄方法。

【請求項4】(a)基板を傾斜させて設定する工程と、
(b)ノズルから薬液を前記基板面に吐出するととも
に、前記基板をスライドさせる工程とを施すことを特徴
とする基板洗浄方法。

【請求項5】(a)基板を傾斜させて設定する工程と、
(b)ノズルから薬液を前記基板面に吐出するととも
に、前記ノズルをスライドさせる工程とを施すことを特
徴とする基板洗浄方法。

【請求項6】(a)基板を傾斜させて設定する基板設定
手段と、(b)前記基板面に薬液を供給するノズルと、
(c)前記ノズルからの薬液を前記基板面に間欠的に吐
出する薬液吐出手段とを具備する基板洗浄装置。

【請求項7】請求項6記載の基板洗浄装置において、
前記基板設定手段は前記基板の角度の変更手段を具備す
る基板洗浄装置。

【請求項8】請求項6記載の基板洗浄装置において、
前記薬液吐出手段は前記ノズルからの薬液の供給を連続
的にON、OFFする制御手段を具備する基板洗浄装
置。

【請求項9】(a)基板を傾斜させて設定する基板設定
手段と、(b)前記基板面に薬液を供給するノズルと、
(c)前記基板設定手段をスライドさせる手段とを具備
する基板洗浄装置。

【請求項10】(a)基板を傾斜させて設定する基板設
定手段と、(b)前記基板面に薬液を供給するノズル
と、(c)前記ノズルをスライドさせる手段とを具備す
る基板洗浄装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、基板（マスクや半
導体ウエハ）の洗浄方法及びその装置に関するものであ
る。

【0002】

【従来の技術】一般に、従来の基板の洗浄装置は、以下
のように構成されていた。

(1)基板を1枚ずつ回転させて薬液をかける。(2)
基板を垂直に立てて薬液に浸して（ディップ）引き上げ
を行う。

【0003】

【発明が解決しようとする課題】しかしながら、上記し

た従来の基板の洗浄装置において、上記(1)の回転方
式では、基板の中心と外側では異物の除去率が相違す
る。また、上記(2)のディップする方式では、異物が
再付着するといった問題点があった。

【0004】本発明は、上記問題点を除去し、基板の面
を均一に、しかも異物が再付着することなく除去するこ
とができる基板洗浄方法及びその装置を提供することを
目的とする。

【0005】

10 【課題を解決するための手段】本発明は、上記目的を達
成するために、

(1)基板洗浄方法において、基板を傾斜させて設定す
る工程と、ノズルから薬液を前記基板面に間欠的に吐出
する工程とを施すようにしたものである。

(2)上記(1)記載の基板洗浄方法において、前記基
板の角度を薬液の種類に対応させて変更するようにした
ものである。

20 【0006】(3)上記(1)記載の基板洗浄方法にお
いて、前記ノズルからの薬液の供給を連続的にON、O
FFするようにしたものである。

(4)基板洗浄方法において、基板を傾斜させて設定す
る工程と、ノズルから薬液を前記基板面に吐出するとと
もに、前記基板をスライドさせる工程とを施すようにし
たものである。

【0007】(5)基板洗浄方法において、基板を傾斜
させて設定する工程と、ノズルから薬液を前記基板面に
吐出するとともに、前記ノズルをスライドさせる工程と
を施すようにしたものである。

30 【0008】(6)基板洗浄装置において、基板を傾斜さ
せて設定する基板設定手段と、前記基板面に薬液を供給
するノズルと、前記ノズルからの薬液を前記基板面に間
欠的に吐出する薬液吐出手段とを具備するようにしたも
のである。

【0009】(7)上記(6)記載の基板洗浄装置にお
いて、前記基板設定手段は前記基板の角度の変更手段を
具備するようにしたものである。

(8)上記(6)記載の基板洗浄装置において、前記薬
液吐出手段は前記ノズルからの薬液の供給を連続的にO
N、OFFする制御手段を具備するようにしたものであ
る。

40 【0010】(9)基板洗浄装置において、基板を傾斜
させて設定する基板設定手段と、前記基板面に薬液を供
給するノズルと、前記基板設定手段をスライドさせる手
段とを具備するようにしたものである。

(10)基板洗浄装置において、基板を傾斜させて設定
する基板設定手段と、前記基板面に薬液を供給するノズ
ルと、前記ノズルをスライドさせる手段とを具備するよ
うにしたものである。

【0010】このように構成したので、

50 (A)ノズルからの薬液を傾斜した基板面に間欠的に吐
出することにより、薬液を基板表面に波状に落下させる

ことができ、表面張力で異物を確実に除去することができる。

(B) 基板の角度を薬液の種類によって調整することにより、最適な異物の除去を行うことができる。

【0011】(C) ノズルからの薬液の供給を連続的にON、OFFすることにより、簡単な構成で、異物の除去効果を向上させることができる。

(D) 基板をスライドさせることにより、ノズル側の構成を簡便化して、異物の除去を行うことができる。

(E) ノズルをスライドさせることにより、基板側の構成を簡便化して、異物の除去を行うことができる。

【0012】

【発明の実施の形態】以下、本発明の実施の形態について図面を参照しながら詳細に説明する。図1は本発明の第1実施例を示す基板洗浄装置の概略構成図であり、基板の側面を示している。図2はその基板洗浄装置の正面図である。これらの図に示すように、洗浄しようとする基板1を薬液3（例えば、硫酸や過酸化水素水などに対して最も異物の除去率の高い角度 θ （例えば、15～60度）に設定する。この角度 θ は角度調整装置4により可変にすることができる。また、この角度 θ は、薬液の種類（例えば、薬液が硫酸の場合、45～60度、薬液が過酸化水素水の場合、15～45度）によって、角度調整装置4により調整することができる。

【0013】このように設定された基板1に、ノズル2より薬液3をノズル2に接続される配管に設置されるON、OFFバルブ5を、制御器6からの制御信号によりON、OFF（例えば、2～3秒ON、5秒OFF）することにより、基板1の表面上に薬液3が波状になり落下し（図3参照）、表面張力で異物を確実に除去することができる。

【0014】図3は本発明の第1実施例を示す基板洗浄装置の部分側面図、図4はその基板洗浄装置の部分正面図であり、基板の表面上の薬液の様子を示している。これらの図に示すように、基板1を角度調整装置4（例えば、基板受け8を円弧状のガイド溝9にそって移動させることによって、基板1のセット角度を調整する）により、異物の除去率の高い角度 θ にセットする。

【0015】次に、薬液の吐出をON、OFFバルブ5（図1参照）の動作により、ON、OFFし、波状の薬液3'が基板1の表面にかかるようにする。なお、7は基板1の上部に配置される薬液3のガイドである。このように、第1実施例によれば、基板に薬液を波状に吐出させることにより、波の先端の表面張力によって異物を確実に除去できる。これを繰り返すことによってより効果が得られる。

【0016】次に、本発明の第2実施例について説明する。図5は本発明の第2実施例を示す基板洗浄装置の概略構成図であり、基板の側面を示している。この実施例においては、基板11をセットした水平移動可能な治具

12を設けて、この治具12を駆動装置13により水平方向に往復移動させ、固定された一つのノズル14から薬液15を吐出することにより、上記第1実施例で示した薬液のON、OFFと同じ効果を得ることができる。

【0017】すなわち、基板11を治具12にセットし、ノズル14より薬液15を吐出させ、治具12を駆動装置13により、往復動作させてスライドさせる。次に、本発明の第3実施例について説明する。図6は本発明の第3実施例を示す基板洗浄装置の概略構成図であり、基板の側面を示している。

【0018】この実施例においては、基板21をセットした治具22を固定しておき、駆動装置25により水平方向にノズル23を往復移動する、一つのノズル23から薬液24を吐出することにより、上記第1実施例で示した薬液のON、OFFと同じ効果を得ることができる。すなわち、基板21を治具22にセットして固定しておき、ノズル23より薬液24を吐出させるとともに、駆動装置25により、ノズル23を往復移動させてスライドさせる。

【0019】上記した第2、第3実施例において、ノズルは一個でも多数個でも構わない。また、ノズルを、一個配置し、各基板毎に、薬液のON、OFFを行い、基板を一枚毎に仕上げて、一方向の移動で洗浄を終了するようにしてもよい。また、上記実施例では、洗浄装置に適用した例を説明したが、現像機及びエッチング装置にも適用可能である。

【0020】なお、本発明は上記実施例に限定されるものではなく、本発明の趣旨に基づいて種々の変形が可能であり、これらを本発明の範囲から排除するものではない。

【0021】

【発明の効果】以上、詳細に説明したように、本発明によれば、以下のような効果を奏することができる。

(1) 請求項1又は6記載の発明によれば、ノズルからの薬液を傾斜した基板面に間欠的に吐出することにより、薬液を基板表面に波状に落下させることができ、表面張力で異物を確実に除去することができる。

【0022】(2) 請求項2又は7記載の発明によれば、基板の角度を薬液の種類により調整することにより、最適な異物の除去を行うことができる。

(3) 請求項3又は8記載の発明によれば、ノズルからの薬液の供給を連続的にON、OFFすることにより、簡単な構成で、異物の除去効果を向上させることができる。

【0023】(4) 請求項4又は9記載の発明によれば、基板をスライドさせることにより、ノズル側の構成を簡便化して、異物の除去を行うことができる。

(5) 請求項5又は10記載の発明によれば、ノズルをスライドさせることにより、基板側の構成を簡便化して、異物の除去を行うことができる。

【図面の簡単な説明】

【図1】本発明の第1実施例を示す基板洗浄装置の概略構成図である。

【図2】本発明の第1実施例を示す基板洗浄装置の正面図である。

【図3】本発明の第1実施例を示す基板洗浄装置の部分側面図である。

【図4】本発明の第1実施例を示す基板洗浄装置の部分正面図である。

【図5】本発明の第2実施例を示す基板洗浄装置の概略構成図である。

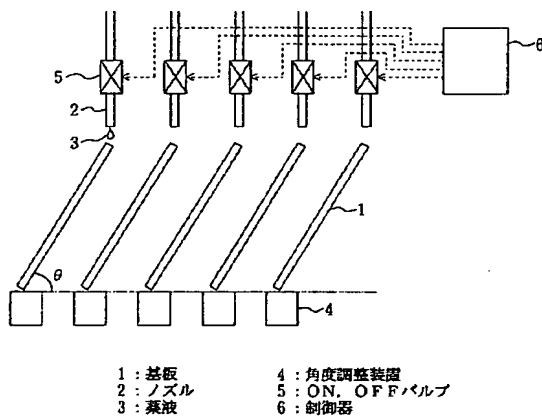
【図6】本発明の第3実施例を示す基板洗浄装置の概略構成図である。

* 【符号の説明】

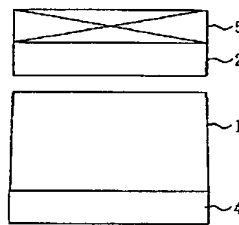
- 1, 11, 21 基板
2, 14, 23 ノズル
3, 3', 15, 24 薬液
4 角度調整装置
5 ON, OFFバルブ
6 制御器
7 ガイド
8 基板受け
9 ガイド溝
12, 22 治具
13, 25 駆動装置

*

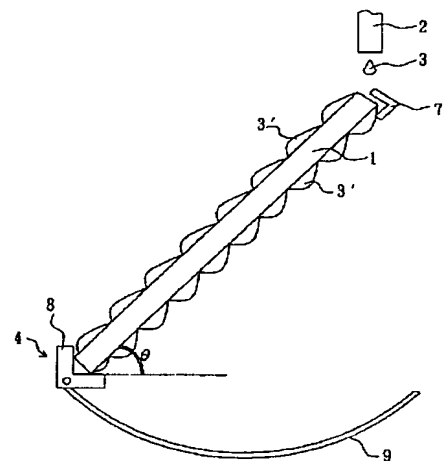
【図1】



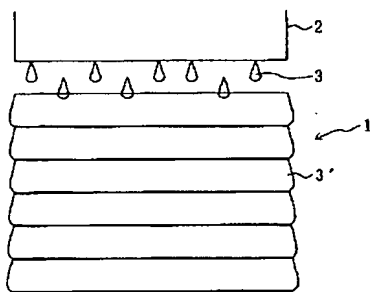
【図2】



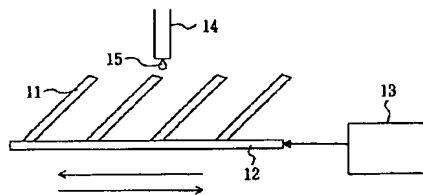
【図3】



【図4】



【図5】



【図6】

